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The technique enabling to measurement the dispersion influence of the phase velocity Lamb wave A_0 mode

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Abstract : The application of ultrasonic guided waves (UGW) is one of the latest methods of non-destructive testing (NDT) and structural health monitoring (SHM). Nowadays, it is widely used in various industrial fields to inspect and screenm any structures by exploring the properties of its waves which can propagate long distances with high sensitivity to structural changes. In this paper a technique based on the zero crossing approach combined with the spectrum decomposition methodis proposed. In general, according to the spectrum decomposition technique, the frequency spectrum of the signal is multiplied by special filter and the signal is reconstructed using inverse Fourier transform. Using this filtered signal, further signal processing is performed applying the zero crossing method. This technique has been investigated using simulated and modelled signals of the Lamb wave asymmetric A_0 mode propagating in the higher dispersion zone. In order to obtain Lamb wave signals for analysis aluminium plates having thickness of 2 mm are used. The excitation signal was 3 periods, 300 kHz burst with the Gaussian envelope. The obtained measurement results are compared with the theoretical dispersion curves obtained by SAFE method. The results have shown that the proposed measurement technique enables not only to reconstruct the phase velocity dispersion curve of the Lamb wave A_0 mode, but also to choose in what precision limits and in what extent of the frequency ranges the dispersion curve of the phase velocity can be reconstructed.

Keywords : Lamb waves, phase velocity, dispersion, Frequency Spectrum